

The Solar EUV Experiment (SEE) is one of the four scientific instruments on the NASA Thermosphere-Ionosphere-Mesosphere-Energetics-Dynamics (TIMED) spacecraft. The SEE instrument will determine the irradiance of the highly variable, solar extreme ultraviolet (EUV) radiation, one of the major energy sources for the upper atmosphere. The SEE measurements are fundamental for the TIMED mission's investigation of the energetics in the tenuous, but highly variable, layers of the atmosphere above 60 km.

The SEE instrument was developed by the Laboratory for Atmospheric and Space Physics (LASP) at the University of Colorado (CU). The solar sensors are the EUV Grating Spectrograph (EGS) and XUV Photometer System (XPS).

The TIMED spacecraft was developed for a shared launch on a Delta vehicle by the Applied Physics Laboratory (APL) at the Johns Hopkins University (JHU). The TIMED spacecraft was launched in December 2001 into a circular orbit altitude of 600 km and an orbit inclination of 74°. Its mission is planned through 2010.

Specifications

SEE System

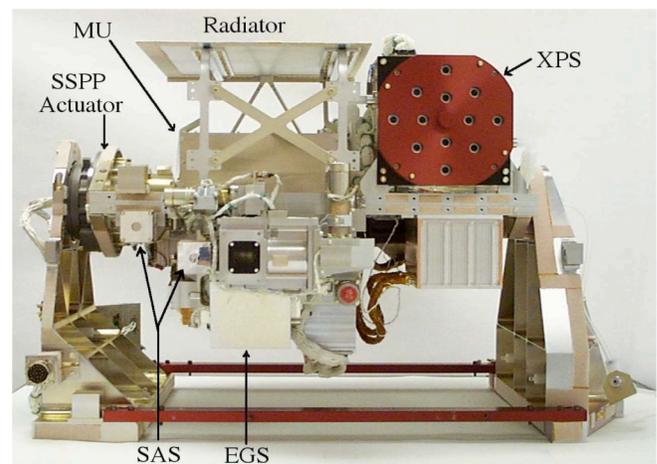
Mass:	27 kg
Power:	27 W (includes 12 W heaters)
Data Rate:	210 bits per second
Observations:	solar, 3 min each orbit
Solar Pointing:	2 arc-min control, 1-axis only SSPP = SEE Solar Pointing Platform
Processor:	1750 MU = Microprocessor Unit
Accuracy:	10% (1- σ)
Preflight Calibration:	NIST Synchrotron Ultraviolet Radiation Facility (SURF-III)
In-flight Calibration:	Redundant channels, and Rocket underflight measurements

XUV Photometer System (XPS)

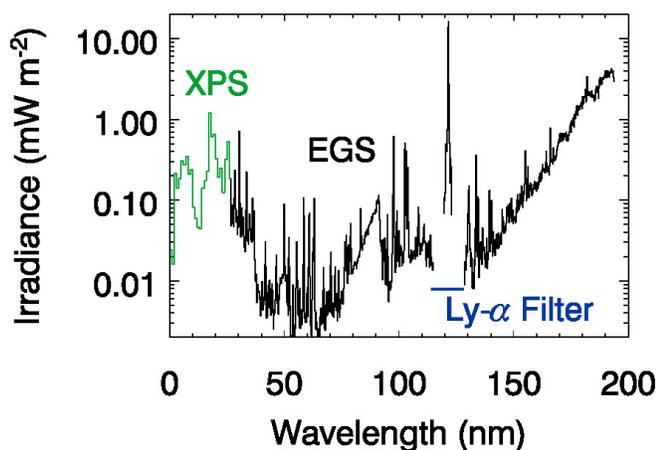
Detectors:	12 XUV silicon photodiodes (Thin film coatings on diodes)
Wavelengths:	0.1 to 27 nm
Resolution:	7-10 nm each
Field of View	12° Diameter

EUV Grating Spectrograph (EGS)

Spectrograph:	Rowland-circle grating design
Detector:	64 x 1024 CODACON (microchannel plates with coded anode position array)
Wavelengths:	27 to 195 nm
Resolution:	0.4 nm (0.17 nm per anode)
Field of View	6° x 12°



Example solar VUV irradiance measurement from TIMED SEE. Emission lines are from the solar chromosphere, transition region, and corona.



SEE Objectives and Data Products

One of the fundamental TIMED mission objectives is to understand the energetics in the mesosphere, lower thermosphere and ionosphere (MLTI). Solar radiation below 200 nm is completely absorbed in the Earth's mesosphere and thermosphere. Changes in the amount of solar radiation, which range from 20% at the longer wavelengths to factors as much as 1000 at the shorter wavelengths, result in corresponding changes in the photochemistry, dynamics, and energy balance of the upper atmosphere. A detailed quantitative understanding of atmospheric radiative processes, including changes in the solar ultraviolet irradiance arising from flares, solar rotation (27 day), or the 11-year solar cycle, is fundamental to the TIMED investigations. The daily measurement of the full-disk solar vacuum ultraviolet (VUV) irradiance by the SEE directly supports the TIMED mission requirement to measure the sources of energy into the MLTI.

The primary science objectives for SEE are to accurately and precisely determine the solar VUV absolute irradiance and variability during the TIMED mission, to study the solar-terrestrial relationships utilizing atmospheric models, and to improve proxy models of the solar VUV irradiance. The VUV range of 0 to 200 nm includes the soft x-ray (XUV) from 0 to 30 nm, the extreme ultraviolet (EUV) from 0 to 120 nm, and the far ultraviolet (FUV) from 120 to 200 nm.

Solar irradiance data are available from the TIMED SEE web page and are integrated into the NCAR Thermosphere-Ionosphere-Mesosphere-Electrodynamics General Circulation Model (TIME-GCM) for solar-terrestrial atmospheric studies. The principle SEE data product is a daily averaged solar irradiance spectrum in 1 nm intervals on 0.5 nm centers. In addition, orbit average (3-minutes) data products are available and are most useful for studying the large, sudden changes during solar flares.

SEE Description

SEE is an experiment designed to measure the full-disk solar irradiance from 0.1 to 200 nm using a grating spectrograph and silicon photodiodes coated with thin film transmission filters. The spectral resolution of the measurements is 0.4 nm above 27 nm and about 7 nm below 27 nm. The solar sensors are designed to let the Sun drift through their field of view once per orbit, so only a one-axis pointing platform is employed for SEE.

SEE was designed and built primarily at the LASP Space Technology Building. One major subcontract for the SEE instrument was to Schaeffer Magnetics, Inc. for the SEE Solar Pointing Platform (SSPP) hardware.

SEE Team

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or

access the TIMED SEE home page at
<http://lasp.colorado.edu/see/>

or

access the TIMED Project home page at
<http://sd-www.jhuapl.edu/TIMED/>

